

REMARKS/ARGUMENTS

Applicants would like to thank the Examiner for considering, initialing, and dating the PTO 1449 filed with the IDS of December 22, 2004, and for adding U.S., 6,797,774 to the list of references considered.

Claims 1 and 2 have been finally rejected as obvious over WO '490, citing U.S. '774, its English equivalent (Kijima), alone or in view of Okamoto (EP '112). Applicants traverse this rejection.

Claims 1 and 2 were previously amended to point out preferred embodiments of the invention processes wherein the product polymer has an intrinsic viscosity of 0.1-0.43 dl/g (Claim 1) or 0.1-0.42 dl/g (Claim 2). The combination of Kijima and EP '112 do not suggest such processes.

Kijima relates to the preparation of a resin for hot melt adhesives prepared in the presence of a transition metal catalyst and a co-catalyst which is either a compound capable of forming an ionic complex by reacting with the transition metal catalyst component or aluminoxane. See column 4, line 21 – column 5, line 40 of the reference. Only aluminoxane is used in the Examples, which concretely describe the reference process. As will be shown, Kijima does not describe a process using a transition metal catalyst and an organoboron co-catalyst to produce a propylene-based polymer having an intrinsic viscosity of 0.1-0.43 dl/g (Claim 1), or 0.1-0.42 dl/g (Claim 2), as claimed in a manner to prohibit patentability under 35 U.S.C. 103.

In the polymerization of a low intrinsic viscosity polymer as in the present invention, the processes differ when using aluminoxane as co-catalyst as compared with an organoboron compound as co-catalyst. This is apparent from the comparison of Example 1 and Comparative Example 1 of the present specification.

In Example 1 using an organoboron compound as co-catalyst, the amount of obtained propylene-based polymer is 100g, whereas in Comparative Example 1 using aluminoxane as co-catalyst, the amount of obtained propylene-based polymer is only 5 g. Clearly, the co-catalysts are not equivalent, as taught in Kijima. Further, in the catalyst system of Kijima, since the influence of hydrogen concentration on the molecular weight of the obtained polymers is small and the catalytic activity thereof under a high polymerization temperature condition is not great, it would be difficult to sufficiently reduce the intrinsic viscosity of the obtained polymers.¹

In contrast, in the present invention, since the influence of hydrogen concentration on the molecular weight of the polymer is large, and the catalytic activity thereof at high polymerization temperatures is high, one is easily able to reduce the intrinsic viscosity of the obtained polymers. This is apparent from specification Examples 4 to 7.

In Example 4, hydrogen in an amount of 0.5 MPa is introduced, and the intrinsic viscosity of the obtained propylene-based polymer is 0.11 dl/g. In Example 5, hydrogen in an amount of 0.3 MPa is introduced, and the intrinsic viscosity of the obtained propylene-based polymer is 0.17 dl/g. In Example 6, hydrogen in an amount of 0.2 MPa is introduced, and the intrinsic viscosity of the obtained propylene-based polymer is 0.31 dl/g. In Example 7, hydrogen in an amount of 0.1 MPa is introduced, and the intrinsic viscosity of the obtained propylene-based polymer is 0.33 dl/g. The propylene homopolymers actually disclosed in Kijima have an intrinsic viscosity as low as 0.5 dL/g using an amount of hydrogen of 0.2 MPa (see col. 7, lines, 58 to 66 and col. 12, P1 in Table 1). As is clear, by using the catalyst

¹ The Examiner has taken the position that the intrinsic viscosity of propylene-based polymers could be controlled by varying polymerization conditions such as lowering the molar ratio of aluminoxane to transition metal or introducing hydrogen to the polymerization system (page 3 of the Official Action). However, no basis for this position is provided, and in fact it is very difficult to furthermore lower the intrinsic viscosity of propylene-based polymers using the catalyst system of Kijima. Moreover, the obtained propylene-based polymers would contain a large quantity of catalyst residue.

system of the present invention the intrinsic viscosity of the propylene-based polymers is easily controlled by adjusting the amount of hydrogen introduced to the polymerization system. Kijima is silent on such characteristics, fails to use an organoboron compound as co-catalyst, and equates boron-containing co-catalysts with aluminoxane. It is thus clear that the present invention is neither taught nor suggested by Kijima.

Okamoto et al. discloses propylene based polymers which are produced in the presence of metallocene catalysts. Specifically, as the polymerization catalysts for production of the propylene-based polymers, there are disclosed polymerization catalysts composed of a transition metal compound and a co-catalyst selected from a compound capable of forming an ionic complex by reacting with the transition metal compound or a derivative thereof, alumoxane, and a Lewis acid (see, e.g., page 3, line 18 to page 4, line 1). The propylene based polymers specifically disclosed in Okamoto et al. have an intrinsic viscosity as high as about 0.7 to 4.4 dL/g (see page 39, Table 2-1).

Importantly, Okamoto et al.'s propylene homopolymers are described as having an intrinsic viscosity of 0.4 to 5.0 dL/g, still more preferably, 1.2 to 3.0, most preferably 1.5 to 2.5 dL/g. When the intrinsic viscosity is less than 0.5 dL/g, the resulting polymer tends to become sticky (see page 9, lines 20-24). The propylene copolymers are described as having an intrinsic viscosity of 0.5 to 15 dL/g, more preferably 1.0 to 5.0 dL/g, still more preferably 1.0 to 3.0 dL/g and when the intrinsic viscosity is less than 0.5 dL/g, the resulting polymer also tends to become sticky. (See page 11, lines 29 to 33).

Okamoto et al. thus teaches away from propylene-based polymers or copolymers having an intrinsic viscosity of less than 0.5 dL/g. Because the presently claimed process produces materials with a significantly lower intrinsic viscosity, it is clear that this reference does not suggest the process of the present invention.

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Accordingly, it is quite clear that neither Kijima nor Okamoto nor their combination disclose or suggest a process as presently claimed wherein a product is produced having an intrinsic viscosity of from 0.1 to 0.42 or 0.43 dl/g. Moreover, the present invention demonstrates the significant differences obtained between the invention materials and those of the prior art, and is thereby distinguished from anything disclosed or suggested by either of the applied references.

Accordingly, and in view of the above amendments to the claims and the remarks presented above distinguishing the applied references from the pending claims, Applicants respectfully request the reconsideration and withdrawal of the outstanding rejections, and the passage of this case to Issue.

Respectfully submitted,

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